

In the Specification:

Please substitute the attached amended specification for the specification on file. The attached amended specification identifies added material by underlining and uses strikeouts to identify that which has been deleted. Please note that no new matter has been added to the amended specification. This amended specification is being filed as a substitute specification for the application on file.

In the Drawings:

Please substitute that attached new drawings for the drawings on file. The new drawings contain all of the numerical indications and reference numbers, which the Examiner has requested. Because of the substantial number of numerical indications and reference numbers, applicant has submitted the drawings in final form, as opposed to circling in red all of the added numerical indications. However, should the Examiner so choose, applicant can submit a copy with all of the added numerical indications circled in red.



AMENDED SPECIFICATION

HYBRID METHOD AND SYSTEM OF THE IMPROVED BIDIRECTIONAL GPS AND CELLULAR/PCS

5

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

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10 The invention is based on a hybrid method of supplementing an improved bidirectional GPS functions with an existing Cellular/User PCS system and of re-transmitting ~~retransmitting~~ coordinates of user and status of I/O (Input/Output) devices into the station. It can be an implemented various intelligent mobile networks in the following fields.

15

1) User applications (When user carries the Cellular/PCS)

(1) Locating identification on real time

(2) Tracking against abduction and Tracing criminal alibi

(3) Logging by the DB Implement on the network

20 (4) User's movement patterns classified by days, weeks, and seasons

(5) User's remote navigation

2) Vehicles and transportation (Compulsory placement of the Cellular/PCS in vehicle)

25 (1) Real-time location of identification for a specific vehicle

(2) Identification for distribution on time and vehicle class by the DB Implement on the network

(3) Identification for over-speeding vehicles

(4) Black box function at car accident

30 (5) Identification for movement and speed pattern of specific vehicle by the DB Implement

(6) Recovery of stolen vehicles

3) Automatic post-payment (Without extra local sensors)

(1) Automatic post-payment for toll gate fees

5 (2) Automatic post-payment for parking fees

(3) Automatic post-payment for admission fees of recreational parks

(4) Automatic post-payment for admission fees for theaters and stadiums

10 4) Identification for exit and entrance

(1) Automatic identification of the office-going hour

(2) Automatic control of restricted area and identification of trespassing

(3) Automatic identification for trespassing numbers of people

15 (4) Utilization as an entrance electrical key

5) Utilization for medical fields (By attaching I/O Interface to Cellular/PCS)

(1) 24 hours real-time monitoring on an electrocardiogram, pulse
20 rate, and brain waves of patients

(2) Monitoring of exercise load tests (Automatic reading of exercise speeds)

(3) Identification for life style of patients by the DB Implement

25 6) Utilization for security inspection at ~~in~~ home and in office (By attaching I/O Interface to Cellular/PCS)

(1) Real-time identification of exact locations by attaching I/O sensor, impact sensor and contact sensor to I/O Interface.

(2) Automatic identification at window and entrance by installing
30 Cellular/PCS

(3) Easy utilization in vehicle and during vacation

7) Utilization in the field of home and office automation (By attaching I/O interface to Cellular/PCS)

(1) Automatic on and off for an electric light at home and in the office through Cellular/PCS

5 (2) 24 hours monitoring of temperature and humidity at home and in office

(3) Remote on and off control for home appliances and equipments

(4) Remote on and off ~~on=off~~ control of electrical and electronic devices in the office

10 (5) 24 hours monitoring of operational status for home/office electrical devices and temperature and humidity

8) Utilization for factory automation and monitoring (By attaching Cellular/PCS to I/O Interface)

15 (1) Remote control of the devices needed to be controlled, frequently moving, in the factory

(2) Utilization on locations needed to be monitored, frequently moving, in the factory

20 9) Utilization on automatic measurement in the industrial applications

(1) Automatic measurement and monitoring of the rainfall

(2) Automatic measurement and monitoring of flood gate (lock) and water level

(3) Automatic measurement and monitoring of internal combustion

25 (4) Automatic measurement and monitoring of noise

10) Utilization as ID cards and credit cards (Substitution to user ID card by improved Cellular/PCS)

30 (1) Substituting an existing ID card by expanded distribution of minimized and improved Cellular/PCS

(2) Easy and safe to carry

DESCRIPTION OF THE RELATED ART

The conventional Cellular/User PCS has been developed and improved in several types of technologies; at early stage, the AMPS of an analog mode was developed, based on FDMA technology. Afterwards, various digital modes were developed, based on FDMA technology. As the network of GSM series, GSM900, GSM800, GSM1900, DCS (Distributed Control System) 1800, PCS1900 have been used. In addition, PDC (Pulse Duration Code) as technologies of TDMA mode have been used. The CDMA mode ~~as same~~ which is a digital mode has also used. Fig. 1a (comprising device elements 127 to 132) shows a structure ~~for the~~ analog mode of AMPS, based on conventional TDMA technology and digital mode based on CDMA. Fig. 1b (comprising device elements 133 to 141) shows an existing GSM mode, based on TDMA.

All standard modes, which have been developed up to date ~~today~~ in Fig. 1a and Fig. 1b, have been used only for mutual exchange of voice ~~sound~~ and character information. In partial GSM transformation technology, there exists a location-identification function (GPS in narrow meaning) ~~by using a~~ carrier signal to identify the location of user in a cell on network. This function is to identify the location of the cell where user exists through the process by Receiver, RF/IF, and Base Band of Cellular/PCS on the signal discharged from the base station of each cell. But, this ~~is~~ does not the function to identify the location of the real coordinates of the user. In other words, the base station on a network as well as user ~~itself~~ cannot locate real coordinates of Cellular/PCS users. Therefore, it might be impossible to locate Cellular/PCS users and to make various intelligent applications by existing modes developed up to date. Besides, as shown in Fig. 2 (comprising device elements 141 to 157), the existing devices of unidirectional GPS ~~itself~~ is too limited since they receive signals in same direction and recognize coordinates independently. It simply recognizes only the location of user ~~itself~~. This

invention has various effects of applications on a network because it transmits the recognized locations of users through the Cellular/PCS communications as well as user identifications, the location of user ~~itself~~.

5 There is another existing technology to identify the location of users. It is the most recent standard mode regulating to identify the user's location in emergency. The existing technology increases the output intentionally in the user terminal in emergencies more than in ordinary times. The increased output signal reaches other adjacent stations out of
10 the station in a cell user location. Theoretically, the transmitted user's location can be recognized when the user arrives in more than three adjacent stations. However, this existing technology has three disadvantages. First, when the frequency for emergency increases, the quality of communication gets worse as a whole because the output of
15 the user terminal is controlled to minimize states in order not to go over to other stations, regardless of the type of Cellular/PCS communication. The numbers of simultaneous users are highly limited and the best quality cannot be kept when the signal reaches other adjacent stations out of its own station. Second, the accuracy to identify the user's location
20 decreases ~~is decreased~~ because there is limitation in sending enough output signals for the user of the terminal to reach more than three stations intentionally. In addition, on probability makes ~~is~~ the invention more accurate and more reliable than the existing technology since this invention identifies the location on real-time basis only in the station the
25 user belongs to. Finally, existing technologies are impossible to identify the real-time locations, but they are used limitedly in emergency. Thus, the invention has various effects of applications on the network.

SUMMARY OF THE INVENTION

The purpose of this invention is to solve problems of location recognition of an existing Cellular/PCS terminals and to have several effects of applications on the network, which does not supported by
5 existing technology, by combining and implementing a simple location identification function of existing unidirectional GPS to Cellular/PCS with bidirectional communications.

10 The invention is to maximize the function of intelligent multipurpose network functions with an existing Cellular/User PCS by identifying the coordinates in GPS and by adding the re-transmitting ~~retransmit~~ function. This invention is also ~~also is~~ to maximize the function of intelligent multipurpose network functions by marking various events (emergency,
15 count), and at the same time, to control the inputs/outputs of various devices. Maximization of the function of intelligent multipurpose network means pre-described various advantages in the industrial fields.

For better understanding, the existing Cellular/PCS device is
20 presented with one-dot chain line ~~lined~~ block in lower part of Fig. 3 and the circuit elements in the block are arranged in an alphabetical order (For example, Antenna 8 ~~(A)~~, Receiver 9 ~~(B)~~, and so on). Moreover, the GPS device with an added re-transmitting ~~retransmitting~~ function is presented with dotted-line block in upper part of Fig. 3, and the circuit
25 elements in a block is presented in the bracketed numbering (for example, Receiver 1 ~~Receiver(1)~~, GPS 2 ~~GPS(2)~~, and so on).

As shown in Fig. 3, the signal from a ~~an~~ conventional active Antenna 8 ~~(A)~~ is transferred to Receiver 9 ~~(B)~~ for a basic function of
30 conventional Cellular/PCS. At the same time, the signal from Antenna 8 ~~(A)~~ is transferred to Receiver 1 ~~Receiver(1)~~ for identification of exact

coordinates. The signal from GPS Receiver 1 ~~Receiver(1)~~ goes through GPS 2 ~~GPS(2)~~, and becomes the input to Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~. In Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~, current date and time is inserted and the various signals are
5 produced through the Function ~~Functional~~ Manager 5 ~~(5)~~. The Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ inputs and outputs processing data to the storage device of the ROM 4 ~~EEPROM(4)~~. The Function Manager 5 ~~(5)~~ inputs and outputs signals through Audio/Control & Interface 13 ~~(F)~~. In addition, the Function Manager 5 ~~(5)~~ sends and
10 receives signals of the External I/O Interface 17 ~~(8)~~, and transfers them to the Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~. The External I/O Interface 17 ~~(8)~~ as a selection device inputs and outputs through A(Analog)/D(Digital), D/A, or direct converter for an analog signal process. The digital signals are fed through digital I/O into the I/O
15 interface 17 ~~(8)~~. All the signals processed at Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ are transmitted through the existing Baseband/ Processor 11 ~~(D)~~ of Cellular/PCS. At the Baseband Processor 11 ~~(D)~~, all the transferred, GPS-related data from a basic function of conventional Cellular/PCS and the Signal Hybrid Processor 3 ~~Signal~~
20 ~~Combination Processor(3)~~ are transferred to the RF/IF 10 ~~(C)~~. At RF/IF 10 ~~(C)~~, transferred signals and information are retransmitted through the Transmitter 16 ~~(I)~~ and Antenna 8 ~~(A)~~. The GPS obtains bidirectional functionality by transmitting real coordinates from the GPS through complex hybridized Cellular/PCS. Both improved transmittable
25 bidirectional GPS and conventional Cellular/PCS are hybridized because they use a common antenna, and they send and receive signals through the Baseband Processor 11 ~~(D)~~ and Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~, and then the Audio/Control & Interface 13 ~~(f)~~ and the Function Manager 5 exchange signals with each other.

30

In Fig.3, the Receiver 1 ~~Receiver(1)~~ receives signals only for determining coordinates from individual satellite for GPS, different from

the waves sent from existing Cellular/PCS communication. The Receiver 9 (B) receives waves only, sent for existing Cellular/PCS communication. Receiver 1 Receiver(1) and Receiver 9 (B) have totally different frequency bands and convert functions. The converted signals through GPS Receiver 1 Receiver(1) become inputs to GPS 2 GPS(2) and outputs of GPS 2 GPS(2) are converted into real coordinates of user's location, and then are fed into the Signal Hybrid Processor 3 Signal Hybrid/Processor(3). At Signal Hybrid Processor 3 Signal Hybrid/Processor(3), all the signals and real output coordinates of the user are processed and transmitted to existing Cellular/PCS through the Baseband Processor 11 (D). In other words, the acquired time of data are marked through the Signal Hybrid Processor 3 Signal Hybrid/Processor(3). In date and time of marking, real coordinates in exact time are acquired and are loaded on the ROM 4 EEPROM(4) in a timely order through the Signal Hybrid Processor 3 Signal Hybrid/Processor(3). The reason why date and time are stored on the ROM 4 EEPROM(4) is that the processing times, taken in transferring them to the station or other users, is different even though acquired coordinates are transmitted on real time basis. It might not be possible to determine the time when the user's coordinates were acquired, in case where the time is counted at the station, other user's terminal, or database. Especially, when the coordinates were acquired at storage mode instead of real time mode, the marking date and time acquired are necessary. It is necessary for acquired coordinates and time to be stored and processed in the database for further application described later. The acquired coordinates and marked date and time are saved at the ROM 4 EEPROM(4) and transferred through the Signal Hybrid Processor 3 Signal Hybrid/Processor(3), and the existing Cellular/PCS Baseband Processor 11 (D) by the direction of Functional Manager 5 (5).

Next, the acquired coordinates and marked date and time through the path of Baseband Processor 11 (D) → RF/IF 10 (C) → Transmitter 16 (4)

→ Antenna 8 (~~A~~) are generated together with the user ID, other user's calling number, and sound signal(that is, other user's called number, user ID, and sound signal) through the Baseband Processor by existing Audio/Control & Interface 13 (~~F~~). In other words, other user's calling number, user ID, sound signal from existing Cellular/PCS are hybridized with acquired coordinates and time from improved bidirectional GPS, and then are transmitted through the antenna. In an existing communication mode which do not generate the user ID, it will be generated in added Function Manager 5 (~~5~~). It is typically the simplest type of functions. The detailed time configurations are presented in Fig. 6. The Fig. 6 shows the modulation at sound communication exclusive mode. At the first half of header(header1), other user's calling number and the user ID exist and at second half of header(header2), acquired Coordinates(C) from the added GPS and acquired Time(t) locate. Afterwards, sound or letter signals are modulated and transferred.

Fig. 6b shows a modulation of acquired coordinates at transmission exclusive mode. The front part of the full header is identical to that in Fig 6a, but is not identical at transferring of acquired coordinates and time instead of sound and letter signal. The transmission exclusive mode of acquired coordinates and time are to be scheduled at the Function Manager 5 (~~5~~).

When the event is acquired through an existing keypad of Cellular/PCS and Sound Recognizer, it is inputted to or outputted from ~~inputs and outputs in~~ Function Manger 5 (~~5~~) through Audio/Control & Interface 13 (~~F~~), and the result is fed into the Signal Hybrid Processor 3 ~~Signal Hybrid/ Processor(3)~~ by setting basic menu functions of Function Manager as shown in Fig. 5. At this time, the modulation is generated in a form of Fig. 6c or Fig. 6d through the Signal Hybrid Processor 3 ~~Signal Hybrid/ Processor(3)~~ and Baseband Processor 11 (~~D~~). This signal is modulated to communicable frequency through the RF/IF 10 (~~C~~) and

transmitted through Transmitter 16 (H) and Antenna 8 (A). By using the Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~, in main menu functions of Function Manager as shown in Fig.5, acquired event is stored at ROM 4 ~~EEPROM(4)~~ first, followed by GPS FUNCTION 26 →
5 TRANSMIT MODE 33 → <STORAGE/TRANSMIT> or <STORAGE ONLY> set. An example of the detailed memory map, when stored at ROM 4 ~~EEPROM(4)~~, is shown in Fig. 7 (comprising memory address 99, GPS data 100, marking time 101, device address 102, status & data 103, and mode 104). In the basic menu of Function Manager of Fig.5, GPS
10 FUNCTION 26 → TRANSMIT MODE 33 → <REAL TIME> mode is set. All values are determined, and the device address, status and data are set. It is modulated as shown in Fig. 6d (comprising elements 85 to 98), and transmitted through Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ → Baseband Processor 11 (D) → RF/IF 10 (C) →
15 Transmitter 16 (H) → Antenna 8 (A). The detailed examples are illustrated.

When the data of I/O Device is transferred through the External I/O Interface 17 (8), they are transmitted through the same path and are
20 processed in a transformed form as shown in Fig. 6c or Fig. 6d, in case of basic menu function of Function Manager in Fig. 5. I/O Interface Function 40 → <Specific I/O Device> → <Device Address> is set by the Function Manager 5 (5). At this time, the difference from prescribed events is the mode and device address as shown in Fig. 6c and Fig. 6d.
25 Fig 4 shows possible combination modes in every case. It is classified into three classes as CASE(a) 18 (1), CASE(b) 19 (2) and CASE(c) 20 (3), are and mode is determined depending on setup of Event and I/O Device. In basic menu of Function Manager in Fig. 5, when Display 27 → Caller Location 29 → Address is set, coordinates of User(a) 105 (H) is
30 transmitted through Transmitter 16 (H) → Antenna 8 (A) and afterwards, User(a)'s coordinates is converted to ASCII in the database of the station when calling other User(b) 106 ~~User(2)~~, and next it is marked to User(b)

106 ~~User(2)~~ with User(a)'s ID and real location (street name) through Receiver 9 ~~(B)~~ → RF/IF 10 ~~(C)~~ → Baseband Processor 11 ~~(D)~~ → Display Device 7 ~~(7)~~.

5 Many types of Cellular/PCS modes developed up to date(for example, various FDMA-AMPS, TDMA-GSM series, TDMA-PDC series, or CDMA mode) are also generally identical to GPS Interface mode and Signal Hybrid mode as shown in Fig.3.

10 Fig.8 illustrates applied examples of implementing various database in case of addition of re-transmitting ~~retransmit~~ function after identification of GPS coordinates in existing Cellular and PCS mode. All coordinates, marked time, events and various I/O information transmitted by user can be transmitted to another user individually, but this can be maximized
15 into effect by implementing the database. The database on the network manages all information of the user as a whole. In addition, it can provide hybrid data services opened on the network for specific purposes(for example, vehicle control/management service, toll fee management services, user management services, remote medical diagnosis services,
20 home/office automation/ management services).

BRIEF DESCRIPTION OF THE DRAWINGS

25 Fig.1 shows a basic structure of existing AMPS(Advanced Mobile Phone Service) (FDMA(Frequency Division Multiple Access)), TDMA(Time Division Multiple Access), CDMA(Code Division Multiple Access), and GSM(Global System for Mobile Communications).

Fig.2 shows a basic structure of conventional unidirectional GPS.

30 Fig.3 shows a hybrid method of improved bidirectional GPS/Interface and Cellular/PCS.

Fig.4 illustrates an example with detailed data combinations.

Fig.5 illustrates an example for basic menu functions of the Function Manager.

Fig.6 illustrates an example for modulations on communications.

5 Fig.7 illustrates an example for memory mapping of the ROM 4 ~~EEPROM(4)~~.

Fig.8 illustrates an example of data base applications for the hybrid method and systems reinforcing GPS re-transmitting ~~re-transmission~~ function with existing Cellular/PCS user terminals.

10

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 The structures and operations in the above sections will be described. ~~Fist of all~~ Now, detailed examples in several cases will be described in detail.

<1> Example of User

20

If Transmitter User(a) 105 ~~User(1)~~ in Fig.8 calls Receiver User(b) 106 ~~(2)~~, through Transmitter User(a) 105 ~~User(1)~~ device → Antenna 8 ~~(A)~~ → GPS 2 ~~GPS(2)~~ in Fig. 3 via coordinate satellite of GPS(g) 113 ~~(9)~~, GPS(h) 114 ~~(10)~~, GPS(i) 115 ~~(11)~~, the received real coordinate and
25 marked date/time 6 ~~(6)~~ signal will go through Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ → Baseband Processor 11 ~~(D)~~, and user ID will be added at the user information manager and retransmitted through RF/IF 10 ~~(C)~~ → Transmitter 16 ~~(4)~~ → Antenna 8 (A).

30 User ID, marked date/time, and user coordinates reach Station 116 ~~(12)~~ and Station DB 117 ~~(13)~~ through PCS(j) 111 ~~(7)~~ or PCS(k) 112 ~~(8)~~ as

shown in Fig. 8. At Station DB 117 (~~13~~) in which all the user information is stored, all the information of User(a) 105 ~~Transmitter(1)~~ is converted into letter information, and all the information including current location(street name) is marked through Station DB 117 (~~13~~) → PCS(k)
5 112 (~~8~~) → Receiver User(b) 106 (~~2~~) → Antenna 8 (~~A~~) in Fig. 3 → Receiver 9 (~~B~~) → RF/IF 10 (~~C~~) → Baseband Processor 11 (~~D~~) → Display Device 7 (~~7~~).

The configuration of the wave packet in time when transferred to the
10 network is presented at the modulation of sound communication exclusive mode as shown in Fig. 6a. The full ~~whole~~ header 45 divides into the first half Header(1) 46 and the second half Header(2) 47. In the first half Header(1) 46, start bit 49, the user ID 52, and mode 50 for control are loaded. The mode 50 is determined into concrete combination
15 by a menu setup of the Function Manager in Fig.5 through Function Manager 5 (~~5~~) → Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ → Baseband Processor 11 (~~D~~). The second Header loads marked real coordinates, time and letter information. After Header, the voice ~~sound~~/letter information, or real-time coordinates are transmitted,
20 depending on which mode comes first.

Coordinates of Transmitter "User(a)" 105 ~~User(1)~~ in Fig. 8 emits through Antenna 8 (~~A~~) → GPS 2 ~~GPS(2)~~, and next, are automatically recorded with Marked date/time 6 (~~6~~) signal in where Transmitter
25 "User(a)" 105 ~~User(1)~~ stores the information on a his/her own device for his/her privacy, and identifies his/her past record.

It explains the case of acquisition of event taken through existing keypad or sound recognizer. This is the case when the signal is inserted
30 at the Function Manager 5 (~~5~~) through Audio/Control & Interface 13 (~~F~~) of Cellular/PCS, and again is stored at the ROM 4 ~~EEPROM(4)~~ through Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ or retransmitted

automatically to RD/IF 10 (C) → Transmitter 16 (H) → Antenna 8 (A) through Signal Hybrid Processor 3-Baseband Processor(3). The acquired event here is memorized or transmitted at the same time together with prescribed and acquired coordinates and acquired time. For detailed
5 examples, when recognized at keypad or sound recognizer in an emergency, acquired coordinate, acquired time, event code, user ID, other user's calling numbers are transmitted together. Other user's calling numbers are in an advanced set at the Function Manager 5-(5), but are not memorized at the ROM 4 EEPROM(4) every time they are
10 acquired. The instance for count and special marking is the same as prescribed examples, but is different in the event code. When Transmitter User(a) 105 User(1) continuously transmits his/her own's coordinates on real time, the information of Transmitter User(a) 105 User(1) becomes Antenna 8 (A) → Receiver 1-Receiver(1), and GPS 2
15 GPS(2) → coordinates of User(a) 105-User(1), and current time will be produced. According to selected items in <GPS Function> → <Transmit Mode> → <Real Time> of the menu in Fig. 5. The signals and modes are marked through Function Manager 5 (5) → Signal Hybrid Processor 3
20 Signal Hybrid/Processor(3), and are transmitted via Baseband Processor 11 (D) → RF/IF 10 (C) → Transmitter 16 (H) → Antenna 8 (A).

The transmitted signal is transferred to the user management service system through Transmitter User(a) 105-User(1), PCS PCS(j) 111 (7) or / PCS(k) 112-(8), Station 116-(12), Control 118-(14), Switching System,
25 and DB 121-(17). The information of Transmitter User(a) 105 User(1) received from the network with opened DB 121 (17) is stored on real time and can provide various services, based on DB generated. User can utilize the DB 121 (17) User total management system through the internet network on the implemented network.

30

When the method of the invention is utilized in a network in Fig. 8, the real time location of a specific user, moving pattern of user by date,

week, and season can be analyzed by the user total management service system. At abduction, the location can be identified by tracking, and it can be utilized for proof of alibi in criminal cases. On attending and leaving the office, it can be used for the exact management.

5

<2> Vehicle and Transportation

Coordinates of Vehicle(c) 107 ~~Vehicle(3)~~ in Fig. 8 are derived from Antenna 8 (A) and GPS 2-GPS(2), and go with marked date/time signal through Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ and Baseband Processor 11-(D), and User Information Manager 14 (G) adds user ID, and then it is transmitted through RF/IF 10-(C), Transmitter 16 (I), and Antenna 8-(A). User ID, marked date/time, and user coordinates can be processed at Station DB 117 (13) through PCS Satellite(k) 112 (8) and Station 116 (12) in Fig.8. When the user uses Cellular/PCS attached in vehicle, the real-time monitoring for specific vehicle and the classes of vehicle in road network and movement pattern by time can be obtained by using a DB on the network in Fig. 8. Besides, one can calculate speed at a specific location of a vehicle or an average velocity of it in a specific area by calculating variables of coordinates, according to time changes, and it can figure out whether it is going over the speed limit. It can allow a remote administration vehicle black box function that reverses tracking status of moving forward and backward, and the speed of vehicle which was in an accident by using data stored in Vehicle/Road Network Management Service System 122 (18) on the network as an example shown in Fig. 8. It is possible to find out and to get a stolen vehicle back by verifying the location of the vehicle by using DB 122 (18) on the network.

30 <3> An Instance of Automatic Toll Payment

When a Vehicle(d) 108 ~~Vehicle(4)~~ in Fig. 8 passes a toll gate or a

parking spot whose location coordinates are already informed, the Vehicle(d) 108 ~~Vehicle(4)~~ passes through Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ → Baseband Processor 11 ~~(D)~~ with real coordinates and marked Date/Time 6 ~~(6)~~ Signals from the device of the passed Vehicle(d) 108 ~~Vehicle(4)~~ through Antenna 8 ~~(A)~~ → GPS 2 ~~GPS(2)~~ in Fig. 3, and adds user ID in User Information Manager 14 ~~(G)~~, and re-transmit through RF/IF 10 ~~(C)~~ → Transmitter 16 ~~(H)~~ → Antenna 8 ~~(A)~~. User ID, marked date/time, and user coordinates are transferred to Station 116 ~~(12)~~ → Control 118 ~~(14)~~ → Switching System 119 ~~DB(18)~~; Vehicle/Road Network Management Service System in sequence through PCS(j) 111 ~~(7)~~ or PCS(k) 112 ~~(8)~~ in Fig. 8. ~~Fig. 8.~~ It can automatically pay later for pre-informed toll and parking on a network because coordinates and time of both directions are verified on the DB 122 ~~(18)~~ opening.

15 <4> Instance of Substitutes for ID Card/Credit Card

Another advantage of using this invention is that it can be an substitute for current ID Card and Credit Card systems and make them more perfect by using Cellular/PCS with an added re-transmitting ~~retransmit~~ function of an improved bidirectional GPS if number of users increases and the size of the product gets smaller. It will be a more perfect ID card system when making it mandatory to attach current ID card by the law on a front panel GPS-Cellular/PCS, because you can make a perfect ID system which is hard to alter in neither time and space set in the new ID card system using this invention digital ID since user's coordinates and time are automatically recorded on real time basis as database on the network in addition to the photo in current ID card system. In case of loss or misuse by a person other than the original card holder, it transmits location information so that it can be restored quickly. It can be prevented from being used by others because all records appear at the DB on a network.

It will be a handy and secure next generation payment system by adding a re-transmitting ~~retransmit~~ function of improved bidirectional GPS of this invention to Cellular/PCS. This means that the seller and the buyer would not have to give and take the credit card as in the current credit card system. All transition information will be checked on real time basis on a network. It would be more secure payment system because on real time, log and user's location are recorded on the separate DB.

The process can be described as follows. A buyer "User(a)" 105 User(1) in Fig. 8 chooses a system menu in Fig. 5 of General Banking/Accounting Management Service of next generation to pay on a network. Seller User(b) 106 (2) in Fig. 8 sets the menu from the device of the invention and asks on the network. If Seller User(b) 106 (2) has already opened a real time database on network, information on User(a) 105 User(1) should already appear on the Display Device 7 (7) through the network. It is why buyer "User(a)" 105 User(1)'s ID, time, and coordinates information are transmitted to the seller User(b) 106 (2) through the network. At this point, seller User(2) just inputs prices through a keypad or voice. Now, seller User(2)'s ID, time, and price information appear on the display device of the buyer "User(a)" 105 User(1), and then final payment request can be made. Buyer "User(a)" 105 User(1) verifies the password by a keypad or voice recognizer, and then payment is made automatically on the network DB.

Next, an explanation will be made on all processes mentioned above in detail. First, the information of buyer "User(a)" 105 User(1) outputs coordinates and current time of User(a) 105 User(1) through Antenna 8 (A) → Receiver 1 Receiver(1) → GPS 2-GPS(2). If <Next Generation DB> → <Banking TMSS> → <Function> → <Payment Request> is selected, the signal will be marked via Function Manager 5 (5) → Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~, and be transmitted through Baseband Processor 11 (D) → RF/IF 10 (C) → Transmitter 16 (H) →

Antenna 8 (A). Transmitted signals are conveyed to Station 116 (12) → Control 118 (14) → Switching System 125 DB(21): Banking/Accounting Management Service through User(a) 105 User(1) → PCS(j) 111 (7) or PCS(k) 112 (8) in sequence as shown in Fig. 8. When DB 125 (21) opens,
5 it waits for Seller User(b) 106 (2) to propose payment, based on information of buyer "User(a) 105" User(1) that has been entered.

Payment ~~Payment~~ to seller user(b) 106 (2) made on the network outputs punched price through Audio/Control & Interface 13 (F) with
10 marked coordinates and time as well as through GPS 2 GPS(2) of seller User(b) 106 (2). If <Next Generation DB> → <Banking TMSS> → <Function> → <Collection Demand> is selected on the menu of Fig. 5, the signal is transferred to Function Manager 5 (5) → Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ and is transmitted through
15 Baseband Processor 11 (D) → RF/IF 10 (C) → Transmitter 16 (H) → Antenna 8 (A). The signal transmitted will be put on the Banking/Accounting Management Service System through Station 116 (12) → Control 118 (14) → Switching System 119 → DB 125 (21) via seller User(b) 106 (2) of Fig. 8 → PCS PCS(j) 111 (7) or PCS(k) 112 (8).

20 Information of buyer "User(a) 105" User(1) and seller User(b) 106 (2) are mutually verified in DB 125 (21) (especially, figuring out location of one another), and are requested for confirmation on the network again, using the path, buyer "User(a)" 105 User(1) → Antenna 8 (A) of Fig. 3 →
25 Receiver 9 (B) → RF/IF 10 (C) → Baseband Processor 11 (D) → Display Device 7 (7) by PCS(k) 112 (8) or PCS(j) 111 (7) on DB 125 (21): Banking/Accounting Management Service System → Switching System 119 (15) → Control 118 (14) → Station 116 (12).

30 If buyer "User(a)" 105 User(1) verifies whether the price matches by the key pad with a password, current coordinates, ID, and time of seller

that have been gained in GPS through Audio/Control & Interface 13 (~~F~~)
→ Function Manager 5 (~~5~~) → Signal Hybrid Processor 3—~~Signal~~
~~Hybrid/Processor(3)~~ as Fig. 3 get marked, and are sent to Station 116
(~~12~~) → Control 118—(~~14~~) → Switch System 119 → DB 125—(~~21~~):
5 Banking/Accounting Management Service System through Baseband
Processor 11 (~~D~~) → RF/IF 10 (~~C~~) → Transmitter 16 (~~1~~) → Antenna 8 (~~A~~)
→ User(b) 106 (~~2~~) in Fig. 8 → PCS(j) 111 (~~7~~) or PCS(k) 112—(~~8~~). DB 125
(~~21~~): Banking/Accounting Management Service System re-verifies
~~re-verifies~~ all contents(price, date, location, user identification) in
10 database. It updates database and informs the final result that it has
accomplished payment to seller User(b) 106 (~~2~~) through PCS(k) 112 (~~8~~)
or PCS(j) 111 (~~7~~) in DB 125—(~~21~~): Banking/Accounting Management
Service System → Switching System 119 (~~15~~) → Control 118 (~~14~~) →
Station 116 (~~12~~) as shown in Fig. 8.

15

As technology evolves, the speed of the network becomes much
faster, devices become smaller, and the law can demand that this device
be attached. All process can be done real time for 24 hours a day. All
procedures mentioned above can be accomplished on the network by one
20 step that buyer "User(a)" 105 User(1) inputs price.

The fact is that coordinates together with time and ID of buyer
"User(a)" 105 User(1) matched with coordinates of seller User(b) 106 (~~2~~)
at the same moment of time. This is verified mutually, and it is surely a
25 evidence that proves that User(a) 105 User(1) appeared at the location
of seller User(b) 106 (~~2~~) for payment. All verification information is
safely stored in DB 125—(~~21~~). If buyer "User(a)" 105 User(1) and seller
User(b) 106 (~~2~~) do a payment transaction in two different places, you can
give the option to re-verify ~~reverify~~ at buyer User(b) 106 (~~2~~) on the
30 network instead of verifying likeness between two the locations as
mentioned.

Customers do not need to present anything to a seller in any case like current credit card. If this improved Cellular/PCS-GPS Hybrid system is used, a perfect payment system can be made on the network that can even verify time and location.

5

<5> An Instance of General I/O Interface

More applied results can be obtained if external I/O Interface 17 (~~8~~) is used, which processed through Function Manager 5 (~~5~~) added in this invention more than in the current simple way that gains an event through a keypad ~~key-pad~~ or voice recognizer. Aux. device which is External I/O Interface ought be a option because it can be separated. Select some of all of the variable I/O devices connected to a specific external I/O Interface 17 ~~Interfaces(8)~~ by Function selection of Function Manager 5 (~~5~~) which will be mentioned later. First, an explanation on digital input device comes. When a specific function selected in the function selection menu of Function Manager 5 (~~5~~) is activated, correspondent device address and status are gained, and coordinates and time gained in the procedure are conveyed to Baseband Processor 11 (~~D~~) through Function Manager 5 (~~5~~) → Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~. In Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~, information of those are sequentially recorded in the ROM 4 ~~EEPROM(4)~~ at the same time. Conveyed device address and status(0/1) ~~status:0/1~~ conveyed to Baseband Processor 11 (~~D~~), gained coordinates and time, and User ID + <number to be Called> generated in current Cellular/PCS are transmitted through RF/IF 10 (~~C~~) → Transmitter 16 (~~H~~) → Antenna 8 (~~A~~), depending on the program of the Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~. <Number to be Called> is conveyed to the Baseband Processor 11 (~~D~~) through current Audio/Control & Interface 13 (~~F~~) that has been set in the Function Manager 5 (~~5~~).

<6> An Instance of Use for Home/Office/Out Door Security

If IR sensor device is connected to digital input, security status can be checked on real time or later through Cellular/PCS. An accurate location and time can automatically be figured when someone breaks into, no matter where the user is. Accuracy of the location depends on accuracy of GPS, and generally it can even identify specific doors or windows in an office, or specific kinds of appliances/equipments. After all signals are transmitted through Cellular/PCS antenna and are received by a specific receiver, accurate location can be monitored where an accident happened and the time it happened compared with the pre-implemented DB. Monitoring is performed by converting to the image processing technique and ACSII code comparing with DB. An advantage, this invention gives, is that improved Cellular/PCS can be used any time in any place unnecessarily being located at a specific location.

Variable history log of a specific time period can be made by saving data that is continually transmitted to DB. The DB implement can be processed as a multiple User management service system in the procedure and process it as monitoring managing per user through the internet network. In the case as above, the user number of different Cellular/PCS is directly entered in the Function Manager 5 (~~5~~), contents of all information transmitted through Antenna 8 (~~A~~) are converted to ASCII characters which have gone through station's DB, and the location, time and status of something happening can be displayed on the display device of other Cellular/PCS users that have been preset as ASCII characters. The information is conveyed through Antenna 8 (~~A~~) → Receiver 9 (~~B~~) → RF/IF 10 (~~C~~) → Baseband Processor 11 (~~D~~) → Signal Hybrid Processor 3 ~~Signal Hybrid/Processor(3)~~ → Display Device 7 (~~7~~) as shown in Fig. 3. A variety of styles of sensors can be connected such as the magnetic contact sensor, impact sensor, and etc. instead of the IR sensor mentioned above.

<7> An Instance of Use for Remote Medical Diagnosis

A device is connected to measure the heart pulse to digital input, the
5 status of user's heart pulse can be monitored any time in any place.
Especially, if the user walks or runs carrying Cellular/PCS, changes of
heart pulse can be monitored depending on the speed of exercise by
calculating heart rate with a location and time on real time or later on.
This can be monitored on each other Cellular/PCS or on central a
10 surveillance service center(supervisory center) respectively. If the
electric current/electro-motive force converting sensor that can read an
electrocardiogram is connected with input device of A/D converter, a
perfect test of physical exercise can be obtained relating with heart
pulse mentioned above. By connecting a variety of switches with digital
15 input, it becomes possible to ~~you can~~ monitor On/Off status. Especially,
GPS can distinguish changes of electrocardiograms on uphill and downhill
by outputting latitude and altitude.

<8> An Instance of Use for Home/Office Automation, etc.

20 If User(a) 105 ~~User(1)~~ or User(b) 106 ~~(2)~~ in Fig. 8 carries
Cellular/PCS, pulse sensor(connected to digital input) and
electrocardiogram sensor(connected to analog input) are connected with
external I/O Interface 17 ~~(8)~~ in Fig. 3, signals of those reach at Station
116 ~~(12)~~ → Station DB 117 ~~(13)~~ → Control 118 ~~(14)~~ → Switching System
25 119 ~~(15)~~ → DB 123 ~~(19)~~ passing through PCS(j) 111 ~~(7)~~ or PCS(k) 112
~~(18)~~ in Fig. 8 through Function Manager 5 ~~(5)~~ → Signal Hybrid Processor
3 ~~Signal Hybrid/Processor(3)~~ → Baseband Processor 11 ~~(D)~~ → RF/IF 10
~~(C)~~ → Transmitter 16 ~~(I)~~ → Antenna 8 ~~(A)~~, and make it possible to create
a remote medical diagnosis service system.

30

Cellular/PCS to Appliance/Equipment(e) 109 ~~(5)~~ as Fig. 8 and digital
output(in case of light bulb) terminal are connected to external I/O

Interface 17-(8), it transmits through Audio/Control Interface 13 (F) → Baseband Processor 11 (D) → RF/IF 10 (C) → Transmitter 16 (I) → Antenna 8 (A) as shown in Fig. 3 in external User(a) 105—User(1), Vehicle(c) 107—Vehicle(3), or laptop computer. Movement of
5 Appliance/Equipment(e) 109 (5) is controlled through Antenna 8 (A) → Receiver 9-(B) → RF/IF 10 (C) → Baseband Processor 11 (D) → Signal Hybrid Processor 3 Signal-Hybrid/Processor(3) → Function Manager 5 (5) → External I/O Interface 17 (8) → digital output Appliance/Equipment (light bulb, refrigerator, TV, etc.) as shown in Fig. 3. When the
10 temperature of inside Vehicle(d) 108 Vehicle(4) or Appliance/Equipment(e) 109 (5) in Fig. 8—Fig is monitored. 8, the rest of the signal process performs as mentioned above, if the temperature sensor is attached to analog input terminal of external I/O Interface 17 (8) as shown in Fig. 3. This concept can also be applied for automatic
15 measuring, monitoring the amount of rainfall, internal combustion, noise, and factory automation.

All processes of examples mentioned above provide advantages to remote control, to monitor and to manage using implemented user
20 utilization DB 124 (20) through the internet network 120 (16) in Fig. 8.

As described, according to the present invention, it becomes possible to perceive present coordinates of a user by the GPS and to use them in local, current Cellular/PCS, or to expect to embody intellectual
25 multipurpose functions as listed below that are impossible to embody with current technology, on network by re-transmitting—retransmitting through current Cellular/PCS network.

- 1) User management(moving/surveillance) system
- 30 2) Vehicle/road network management service system
- 3) Toll payment management service system
- 4) Remote medical diagnosis service system

- 5) Family/office security and automation management service system
- 6) Security area entrance/exit monitoring management service system
- 7) Automatic payment management service system
- 5 8) Factory automation/control management system
- 9) Perfect substitute system for ID card and credit card system
- 10) Substitute electronic key lock system for current key lock system

10 It will be evident to those skilled in the art that many other modifications are possible within the spirit of the invention. Therefore, the scope of the invention should be determined by reference to the claims appended below and their equivalents.